Visualization of macrophage recruitment in head and neck carcinoma model using fluorine-19 magnetic resonance imaging.

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Public Summary:
To evaluate the role of infiltrating macrophages in murine models of single and double mutation head and neck tumors using a novel fluorine-19 (19F) MRI technology.

Scientific Abstract:
PURPOSE: To evaluate the role of infiltrating macrophages in murine models of single and double mutation head and neck tumors using a novel fluorine-19 ((19) F) MRI technology. METHODS: Tumor cell lines single-hit/SCC4 or double-hit/Cal27, with mutations of TP53 and TP53 & FHIT, respectively, were injected bilaterally into the flanks of (n = 10) female mice. With tumors established, perfluorocarbon nanoemulsion was injected intravenously, which labels in situ predominantly monocytes and macrophages. Longitudinal spin density-weighted (19) F MRI data enabled quantification of the macrophage burden in tumor and surrounding tissue. RESULTS: The average number of (19) F atoms within the tumors was twice as high in the Cal27 group compared with SCC4 (3.9 x 10(19) and 2.0 x 10(19)(19) F/tumor, respectively; P = 0.0034) two days after contrast injection, signifying increased tumor-associated macrophages in double-hit tumors. The difference was still significant 10 days after injection. Histology stains correlated with in vivo results, exhibiting numerous perfluorocarbon-labeled macrophages in double-hit tumors and to a lesser extent in single-hit tumors. CONCLUSIONS: This study helps to establish (19) F MRI as a method for quantifying immune cells in the tumor microenvironment, allowing distinction between double and single-hit head and neck tumors. This technique would be extremely valuable in the clinic for pretreatment planning, prognostics, and post-treatment surveillance. Magn Reson Med 79:1972-1980, 2018. (c) 2017 International Society for Magnetic Resonance in Medicine.